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THE FUTURE IS ELECTRIC OPEN ACCESS

The Future is Electric: Unveiling the Power behind Electric Vehicle Motors

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Abstract:

Electric vehicles (EVs) have gained significant popularity in recent year as a sustainable and environmentally friendly alternative to traditional gasoline-powered cars. One of the key components that make EVs possible is the electric motor. In this article, we will explore the power behind electric vehicle motors and how they are revolutionizing the automotive industry.

***Keywords*- motor size, motor efficiency, motor controllers, dc motors, EV motors.**

I. Introduction

In the 1960's and 1970's, alternative fueled vehicles were introduced as a solution to the exhaust emissions problems caused by internal combustion engines, and to reduce reliance on imported foreign oil. Over the years since, there have been numerous attempts to create practical electric vehicles, and there will be more attempts in the future. In this report, we'll look at the technology behind electric vehicles and explain why they're better than internal combustion engines. We'll also look at why electric vehicles have grown so quickly and why it's a necessity to improve our world today. We'll also break down the key parts of an electric and hybrid vehicle, compare them to each other, and look ahead to the future of electric vehicles. Finally, let's look at the overall impact of electric vehicles on the people. Electric vehicles are 97% cleaner than gasoline powered vehicles. They don't produce any tailpipe emissions, so you don't have to worry about particulate matter in the air. Gas-powered vehicles release carcinogens into the atmosphere, which can increase asthma conditions and irritate your respiratory systems.

The paper begins with an overview of the history of electric vehicles, including the low and high points of production, as well as the reasons for the transition. Next, we look at the technical aspects of an electric vehicle (e.g., parts, functions, and theory of operation), followed by a description of the hybrid car (e.g. parts, functions, theory of operation). Drawing on this knowledge, I compare the efficiency of the internal combustion engine (IC), the hybrid engine (EC), and the electric engine (EV) in terms of power, speed and acceleration, as well as maintenance, mileage and cost. Finally, I close the paper with sections on the pros and cons of electric vehicles and their future prospects.

II. Electric Vehicle (EV) History

The first electric vehicle was built in Scotland in 1832 or 1839 (the exact year is unknown)

by Robert Anderson. The first crude electric carriage was built in America in 1895 by A. L. Ryker with the invention of an electric tricycle, and William Morrison with the invention of a six passenger wagon. Wood's Electric Phaeton was more than a horseless carriage and a surrey in 1902. The Phaeton had an 18 mile range, a maximum speed of 14 mph, and a price of $2,000. The decline of the electric vehicle began in the 1920's. Factors that contributed to this decline include the improvement of the road system, the decrease in the price of gasoline due to the discovery of Texas crude oil, the invention of the electrical starter, and mass production of internal combustion engine vehicles. According to the history of electric vehicles, in 1912 an electric roadster cost $1,750 and a gasoline car cost $650 (p. 1). Electric vehicles declined completely by 1935.

III. Description of an Electric Vehicle

Electric vehicles (EVs) are powered by a motor that runs on a battery pack of rechargeable batteries instead of a petrol engine. An EV does not look like an electric vehicle from the outside. Most electric cars are built by converting a petrol car. The only thing that makes an EV look electric is that it is almost silent. What is an electric vehicle? An electric motor, controller, and rechargeable battery are the four main parts of an electric vehicle. An electric motor is powered by a battery pack. An electric motor uses the power from the battery pack to turn a transmission, which in turn turns the wheels. The transmission is powered by the DC (direct current) controller, which uses the DC (current) to turn the wheels.

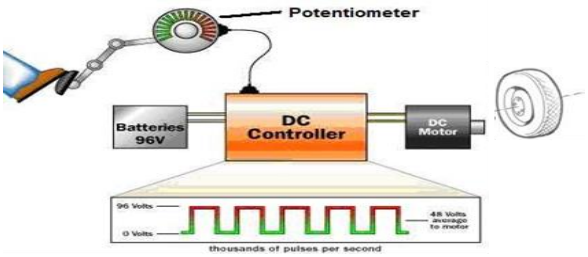


Figure 1: Parts of an electric vehicle [3].

IV. Description of Parts and their Functions

1. Potentiometer

Potentiometer is a circular device that is connected to the accelerator pedal, the potentiometer is also known as the variable resistor. It provides the signal to the controller that tells it how much power it should deliver.

2. Batteries

Batteries provide power to the controller. There are three types of batteries, lead-acid, lithium ion and nickel metal hydride. Batteries have a voltage (power) range.

3. DC Controller

The DC controller takes the direct current from the batteries and supplies it directly to the motor. It can deliver zero power when the car is stopped, full power when the driver lowers the accelerator pedal, or power levels in between. If a battery pack contains 12 12-volt batteries that are wired in series to generate 144 volts, the DC controller will take the 144 volts direct current and supply it to the motor under controlled conditions [3].

The controller reads the accelerator pedal settings from both potentiometers and modulates the power accordingly. For example, if the accelerator pedal is set to 25% of the way down the accelerator, the controller modulates the power so that the accelerator pedal is on 25% of the time and is off 75% of

the time. The controller will not operate if the signals from both of the potentiometers do not match. [3]

4. Motor

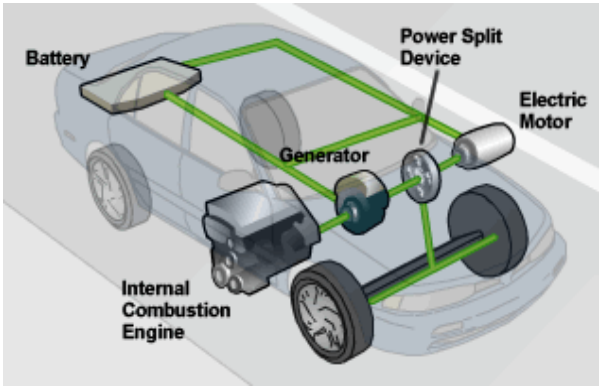
The motor is powered by the controller and rotates a gearbox. The gearbox rotates the wheels, turning the vehicle into motion.

V. Theory of Operation for EV

When the driver pedals, the potentiometer turns on and sends a signal to the controller telling it how much power it should deliver. There are also two safety potentiometers. The controller will read the accelerator pedal setting from the potentiometer, regulate the power accordingly, take power from the batteries, deliver power from the batteries to the motor, the motor will receive power from the controller and use this power to turn the transmission, the transmission will turn the wheels and cause the car to move forwards or backwards. When the driver kicks the accelerator pedal down, the controller delivers to the motor the full battery voltage. When the driver takes his foot off the accelerator the controller delivers 0 volts to the motor and for any setting in between the controller cuts the battery voltage a thousand times per second to produce an average voltage that is somewhere between 0 to full battery pack voltage.

VI. Description of a Hybrid Vehicle

The HV is powered by an internal combustion engine (IC) and an electric motor (EV). The IC engine supplies most of the vehicle's power, while the EV provides extra power when needed (e.g. when accelerating and passing). A hybrid vehicle is powered by a gasoline engine and an electric motor. A



hybrid car has a small gas engine that is fuel efficient and an electric motor that helps the engine when it is accelerating. The electric motor powers the HV using batteries that are automatically recharged while driving. The HV is composed of five main components: the battery, the ICE, the generator, the power split device and the electric motor.

VII. Description of Parts and their Functions

1. Battery

The battery is the energy storage device of the electric motor in a hybrid car. Unlike the gasoline engine, which can only charge the battery, the electric motor of a hybrid car can charge the battery as well as draw power from the battery.

2. Internal Combustion Engine (ICE)

The internal combustion engine (ICE) of a hybrid car is the same as the internal combustion engine of a conventional vehicle. However, the internal combustion engine on a hybrid car is smaller and uses more advanced technologies to improve fuel efficiency.

3. Generator

The generator is similar to the electric motor, but the generator is only used to generate electricity for the battery.

4. Electric Motor

For instance, when needed, the electric motor accelerates the car by taking energy from the batteries.

5. Power Split Device

The power split device is the device that sits between the electric motor and the battery and, together with the electric motor, forms a continuously variable transmission

VIII. Advantages and Disadvantages of the EV

One of the biggest challenges that EVs face is the rechargeable battery itself. Most EVs only travel about 100-200 miles before they need to be recharged. Fully charging a battery pack can take anywhere from 4-8 hours. The battery pack is heavy, expensive, might need to be replaced at some point, and takes up a lot of space in the vehicle. All in all, an electric vehicle has more benefits than drawbacks. Benefits include: No tailpipe emissions Reducing global warming Reducing unhealthy people Table 2 summarises the benefits and drawbacks of an electric vehicle.

IX. Future of the EV

Most likely, future electric cars will be powered by LiFePo4 batteries, which are becoming more and more popular in developing countries. LiFePo4 is rechargeable and highly efficient, and is already used in electric bicycles and scooters, and is likely to be adopted in future electric cars. Other technologies that are likely to be used in future electric cars include supercapacitor technology and ultracapacitor technology, both of which are used to store and deliver electrical charge. Supercapacitors are used in hybrid car prototypes and are expected to be used in the future electric car markets. If future electric car developers are able to develop vehicles with a 300-mile range, a 5- to 10-minute charging time, and a high level of safety in operation, the market will be wide open. Researchers are also working on advanced battery technologies to improve driving range, reduce recharging times, and reduce weight and costs. Ultimately, these factors will shape the future of electric vehicles [8].

X. Conclusion

In conclusion, electric vehicle motors play a crucial role in the success and widespread adoption of electric vehicles. With their high efficiency, impressive performance, and environmental benefits, electric motors are paving the way for a greener and more sustainable future in the automotive industry. As technology continues to advance, we can expect even more exciting developments in electric motor technology, further solidifying the future of electric vehicles.

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References

1) *Electric Cars: Effect on the Environment. (1998) Retrieved January 31, 2010 from http://library.thinkquest.org/20463/environment.html.*

2) *Bellis, M. History of Electric Vehicles. Retrieved January 31, 2010 from http://inventors.about.com/library/weekly/aacarselectrica.htm.*

3) *Brain, M. (2002). How Electric Cars Work. Retrieved January 29, 2010 from http://auto.howstuffworks.com/electric-car2.htm.*

4) *How Hybrids Work. (2009) Retrieved February 20, 2010 from http://www.fueleconomy.gov/feg/hybridtech.shtml.*

5) *Electric Vehicles (EVs).(2009) Retrieved January 31, 2010 from http://www.fueleconomy.gov/feg/evtech.shtml.*

6) *Dunn, P. (2006). Hybrid Cars – Pros and Cons. Retrieved February 20, 2010 from http://www.physorg.com/news10031.html.*

7) *Sparling, B. (2001). Ozone Layer. Retrieved February 1, 2010 from http://www.nas.nasa.gov/About/Education/Ozone/ozonelayer.html.*

8) *Future Electric Cars. (2007) Retrieved January 29, 2010 from http://www.future-car.ghnet/future-electric-cars.html.*